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Research Report

Participating in the Pembina Forage Association's field day: (from left) association president Don Petryshen; association manager Lorne Cole; pasture committee chairman Ron Kwasney.

The future is now

Feedlot results from rotational grazing

Alberta is Canada's top cattle producing province. About 49% of Alberta's $3.9 billion agricultural cash receipts come from livestock and livestock product sales. Recognizing the industry's significance, the On-Farm Demonstration component of Alberta Agriculture's "Farming For The Future" has supported 39 forage projects around the province with $184,273 in grants since 1982, the year this producer-participation aspect of the program began. And about 60 farmers participating in a site tour last month near Westlock, co-sponsored by the Pembina Forage Association and Alberta Agriculture, learned about one of the most successful projects yet, where producer Keith English of Dapp found a way to reduce the average grazing space per cow-calf pair by 50%.

The project was a two-year effort, supervised by Ken Lopetinsky, Alberta Agriculture Forages and Special Crops Specialist, and Alberta Agriculture Regional Livestock Supervisor Rob Hand, both based in Barrhead. There was very little information available on the performance of yearlings on well-managed and rotationally-grazed pastures in north-central Alberta, so Mr. English and company set out to establish some data.

The project started in May 1982. His pasture land was divided up into five plots of 20 acres and one of 15 acres. Pastures A and B were mostly native grasses, and pastures C, D, E and F were mainly timothy with some clover. They were all fertilized with two applications of nitrogen fertilizer (34–0–0) 200 pounds per acre in May, and 150 pounds per acre in mid-July.

In June, 80 yearling steers (a mix of Charolais, Herefords and Angus-Herefords) were implanted with either Synovex or Ralgro, weighed to the nearest five pounds, then randomly divided into two groups. The first group was rotationally grazed on pastures C to F, while another group was rotationally grazed on A and B and given a "salt limit feed grain mix" to lower its intake of grain, so the cattle would still graze. Then all the yearlings were removed from the pasture for finishing in a feedlot.

It was revealed that the grain fed steers on pastures A and B had not outgained those deprived of the extra feed. The reason, according to the project participants, could be traced to the rotational grazing. Normally, animal performance is not maintained during the final 25% to 33% of the grazing season, since pasture production declines while animal requirements increase. But with rotation, there is always available forage, no matter when.

That fall, manure was applied to the fields. The following spring 1.5 pounds per acre of timothy and 1.5 pounds per acre of alsike clover were broadcast, followed by 150 pound-per-acre treatments of 34–0–0 in June and again in mid-July. "This pasture renovation, by improving the quality of the forage, seems to have really helped in increasing the number of cattle that can graze in a given area," says Mr. Hand. All participants agree that resetting fences during the rotational grazing requires a bit more producer participation. But ultimately, it's worth it. "Many area farmers have tried it since we did," says Mr. Hand, "and of those we've surveyed, we found we can reduce the average of four or five acres per cow-calf pair to about two acres."

Dr. Gary Mathison conducting research at the unit.

Food for thought

Ellerslie's unique forage evaluation unit

There's only one way animal feed gets into the corral, but there's two ways it can leave: on four legs, as weight gain on an animal, or on four wheels, as fecal waste in the bucket of a front-end loader. Livestock producers give their animals the most digestible feed possible, so the food energy is metabolized and made into muscle, not manure. And to help producers identify which feeds are best, Alberta Agriculture's "Farming For The Future" provided the startup funding for the Ruminant Feed Evaluation Unit at the Ellerslie Research Station just south of Edmonton, where scientists have compiled data on 210 feed samples since 1978.

The idea for the unit struck Dr. Jerome Martin, presently a research analyst with the Research Division of Alberta Agriculture, eight years ago. At the time, he was working in the Soil and Feed Testing Lab of Alberta Agriculture. He came to realize that there was virtually no information published on the energy value of Alberta feeds. "All our data," he says, "came from the United States or the U.K., and with different soils and climatic conditions, feeds just aren't the same."

Dr. Martin, who holds a Ph.D. in animal nutrition, had read about a feed evaluation unit at the *Rowett Institute* in Scotland. So he approached colleagues Dr. Gary Mathison, a Professor of Animal Science at the University of Alberta, and Dr. Larry Milligan, now Dean of Research at the University of Guelph, to help establish a similar facility in Alberta. In 1979, Mr. Ronald Weisenburger, now Head of the Beef, Cattle and Sheep Branch of Alberta Agriculture's Animal Industry Division joined the "3-M" team of Martin, Mathison and Milligan, and in 1979 obtained $190,000 from "Farming For The Future" during its first five-year mandate, 1979–84. That program continues to fund the unit as a facility where the University of Alberta can conduct studies.

Shout it out

Contaminated coveralls won't come clean

Because of the marked increase in the use of herbicides and pesticides over the past few decades, and the adverse health effects which may result from accidental exposure, the importance of reducing the possibility of chemical contact is crucial. The most common means of exposure and absorption of such chemicals is via the "dermal" route (through the skin), rather than through the respiratory system. So with the help of a $83,812 grant from Alberta Agriculture's "Farming For The Future" Research Program, Dr. Nancy Kerr and Dr. Katherine Rigakis—respectively, a Professor and Research Associate attached to the University of Alberta's Department of Clothing and Textiles—surveyed 187 Alberta farm families to determine how farmers are addressing this situation. Their project was entitled *Efficacy of Selected Laundry Practices used by Alberta Farmers in Removing Pesticide Residues from Clothing.*

The researchers discovered that rather than using recommended "moisture-impenetrable total body coverings," producers generally wear their ordinary work clothing when handling and applying chemicals, and take no special precautions when handling, storing and cleaning such garments. "Since these garments are frequently washed along with the rest of the family wash," they report, "other clothing may become contaminated, resulting in secondary exposure to other family members."

Further studies by the researchers have addressed the problem of getting the chemicals out of clothing. For the very best results, they recommend a pre-wash treatment with a solvent-based spray like "Spray 'n Wash" or "Shout," followed by two hot washings in 60 degrees Celsius water. But even then, 16.7% of Avadex remains in the clothing. The best choice, they maintain, is for farmers to use fully protective clothing, like a disposable polypropylene suit which is available commercially for about $10. They're now conducting more tests on those garments. And that's applauded by Dr. Moe Hussain, pesticides issues co-ordinator for Alberta Agriculture. "Farmers," he says, "must be sure these outfits are safe and practical."

According to Dr. Mathison, who now heads the unit, researchers are concerned with two areas. The first, and easiest to record, is an animal's voluntary intake of the various feeds. For this, researchers observe whether the unit's 40 resident cattle and sheep treat their meals as a feast, or turn away in disgust. Secondly, the feed's digestibility is measured. Its gross energy value is easily determined by using a "bomb calorimeter," a six-inch high cylinder in which the feed sample is burned.

But that still doesn't tell researchers how well the feed will be truly digested by an animal, since it converts a certain portion into manure, methane gas, urine and heat. So for eight days test animals are enclosed in atmospherically controlled "calorimeter chambers" from which air can be extracted and analyzed. Together with feces evaluation, researchers can then determine the tested feed's energy value, based on how much is likely to be turned into muscle, and how much will pass through.

Alberta's feed evaluation unit is the only facility of its kind in Canada, and one of fewer than 10 in the world. "Still," Dr. Mathison says, "there are no secrets here. We have made the results of our work known in various publications over the years, and the end result should be a data base with easily attainable information on Alberta feeds. We are, in essence, trying to work ourselves out of a job."

Dr. Katherine Rigakis (foreground) and Dr. Nancy Kerr with testing equipment.

FARMING FOR THE FUTURE

by Jim Mahone
Director of Research
Alberta Agriculture

Where do we begin? Do we start with a chicken or an egg? The conflict between market-driven versus technology-driven research is only slightly less perplexing than the chicken and the egg conundrum. Chickens weren't developed because there was a market for eggs. Eggs weren't developed because there was a market for chickens. Twenty-five years ago, there was no market for canola. Nor would one exist today, if the decision to fund basic research in rapeseed breeding had been based on market-dictated demands.

This is not to belittle the importance of market forces in shaping a very large portion of our research priorities. Without markets, our farmers' way of life would perish. Market needs and research into present and future markets are just as essential to agriculture's future as the development of any new plant or livestock variety.

But a delicate balance must be struck between the research spawned by market demand, and basic, predictive, technology-driven research. This synergistic relationship will bring forward the dynamic agricultural research that will improve the life of every man, woman and child in the province. To some, these great changes that are coming will seem threatening. Others, at the leading edge, will welcome the innovations that will shape our lives.

This month, I will be leaving Alberta Agriculture. While I look forward to the personal challenge I am taking up as Director of Research at the University of Guelph, I am sad to say goodbye to my good friends in Alberta. I would like to thank and encourage all of you who have worked to further agricultural research: producers, Members of the Legislative Assembly, members of private industry, scientists and university staff. I especially want to thank the staff at Alberta Agriculture, not only in the Research Division but also the specialists and key extension staff who do so much to bring new and innovative technology to the progressive producers of this province.

I couldn't leave without expressing my gratitude to Ben McEwen, Deputy Minister, and Art Olson, Assistant Deputy Minister of Research and Resource Development. It is only as a result of their consistent support, encouragement and willingness to take risks over the past four years that I have been able to accomplish just some of my goals for agricultural research.

There is so much more that needs to be done. I feel certain that all of you will continue the necessary and expanding agricultural research effort. In the larger context, I hope that my work at Guelph will be able to contribute to that effort as well.

Goodbye and good luck.

Where's the beef? Everywhere!

Thanks to ALT's multi-fertilization technique, this cow simultaneously produced 21 identical offspring.

Alberta livestock researchers clone Canada's finest calves

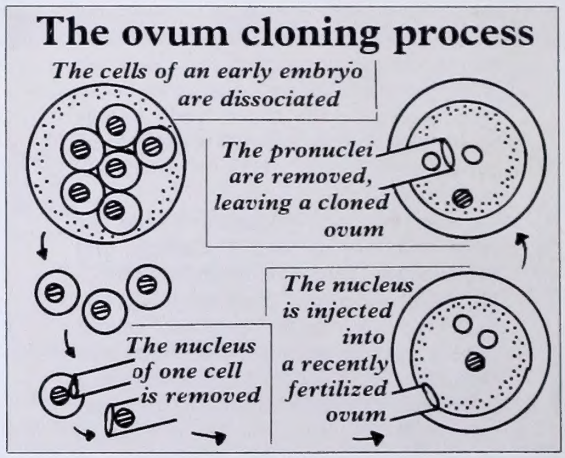
Like the traders of virtually any agricultural commodity, cattle buyers doing business in either the domestic or international market will go wherever they get the best quality, price and selection. Alberta breeders offer cattle with superb lines at competitive prices. But according to Dr. Brian Shea, reproductive physiologist with Calgary's Alberta Livestock Transplants Ltd. (ALT), the province lacks an appreciable quantity of top quality calves, because it doesn't have enough cows that are "super-producers." So when buyers go shopping for cattle, they may tend to pass Alberta by because they can get a better "package" elsewhere. But Dr. Shea wants to change that situation.

With the help of an $85,000 grant from Alberta Agriculture's "Farming For The Future" Research Program, Dr. Shea has embarked on a research project to improve the province's calf stock. His study, dubbed *Production of Large Numbers of Genetically Identical Calves (Clones) by Nuclear Transplantation*, is designed to bolster the best of the bunch. "Increasing the number of top calves available in Alberta would have a major impact on buyers," he says, "since all their needs could be met in one location. Not only could more sales be expected to come to our province, but the numbers of cattle involved in each sale would rise. The one requirement is that the number of top producing calves be increased significantly."

His research will concentrate on "nuclear transplants." The objective is to produce unlimited numbers of clones of specific calves by transplanting nuclei from early embryos (those with just eight to 32 cells) into activitated, enucleated ova. The transplanted nuclei then direct the formation of genetically identical copies, because they are in fact clones of the same embryo. After the cloning, the new embryos are introduced into recipient cows. "Success," says Dr. Shea, "will be assessed by the transfer of cloned embryos to recipients to determine if pregnancies are established."

The researcher says the technique for conducting nuclear transplantation is straightforward [*see diagram*]. The cells of an early embryo are "dissociated" by incubation for a short time in a calcium-free and magnesium-free solution, containing the enzymes pancreatin and trypsin. A mechanical agitator is then used to separate the embryonic cells. Nuclei are removed from the cells with the aid of a "micromanipulator" and are injected into recently fertilized ova obtained from another donor. This is followed by the removal of the existing pronuclei from the fertilized ova, so the transplanted nuclei can accomplish their task.

Alberta Livestock Transplants is already an industry leader in similar genetic research. When it started in 1971, it was the only private firm in the world dedicated to commercializing bovine embryo transfer. One of its most successful ventures has been the firm's "multi-fertilization technique." Donor cows are stimulated to simultaneously release a dozen or so ova, then artificially inseminated with select semen and flushed out before the fertilized eggs adhere to the uterine wall. Then recipient cows are implanted with the fertilized eggs.



That process produces similar—but not identical—calves, as the nuclear transplant program proposes to do. And Dr. Shea believes the cattle industry will enthusiastically receive this new venture. Says he: "The additional aspect of a buyer being able to see a calf genetically identical to the one he is purchasing would certainly increase sales."

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